PEACE/WILLISTON
FISH & WILDLIFE
COMPENSATION
PROGRAM

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Peace Williston Fish and Wildlife Compensation Program Summary of Fisheries Activities 1988 – 1997 BG

B. G. Blackman
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PWFWCP Report No. 260

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The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

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Website: *www.bchydro.bc.ca/environment/initiatives/pwcp/*

This report has been approved by the Peace/Williston Fish and Wildlife Compensation Program Fish Technical Committee.

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PEACE / WILLISTON FISH AND WILDLIFE COMPENSATION PROGRAM

SUMMARY OF FISHERIES ACTIVITIES

Projects initiated in

1988

1988 **Reservoir Gill Netting Studies**

Objective: Determine the relative abundance, distribution, and growth rates of fish species in Williston Reservoir, what changes have occurred since the 1974-75 studies, and evaluate the feasibility of a commercial fishery for lake whitefish in the reservoir.

- Relative abundance of riverine species, mountain whitefish, arctic grayling and rainbow trout declined.
- Kokanee, peamouth chub, bull trout and lake trout increased.
- Lake whitefish remained the most abundant species, but size at age declined significantly.
- No potential for a commercial fishery for lake whitefish because of the small size of the fish.

Completed: 1988

Report(s): No. 239 Fisheries Resources of Williston Reservoir Twenty Years after impoundment. B.G. Blackman. April 1992. 35 pp plus appendices.

1988 **Hydro Acoustic Studies**

Objective: Determine the numbers of fish utilising Williston Reservoir as a baseline for future evaluations.

- Estimates of numbers of fish utilising different areas of the lake were highly variable.
- Did not give good estimates of the numbers of fish utilising near shore and shallow areas.
- Population estimates were 4.8 million $\pm$ 29% in June, 11.2 million $\pm$ 32 % in September and 7.1 million $\pm$ 36% in October.

Completed: 1988

Report(s): No. 57 Hydroacoustic surveys of Williston Reservoir (June, September, and October, 1988). R.L. Johnson and I. Yesaki. November 1989. 35pp plus appendices A through G.

1988 **Mercury Tissue Sample Studies**

Objective: Determine the concentration of mercury in the tissues of the different size classes of the fish species present to ascertain if there was a potential health hazard.

- Mercury concentrations exceeded Health and Welfare Canada guidelines for bull trout greater than 1 kg, warning in Fisheries regulations that "Mercury levels in bull trout" - "from Williston Lake" - "may be high. Normal consumption is not a significant hazard to human health but high consumption may be."

Completed: 1989

Report(s): 1990 "Evaluation of Mercury Concentrations in Selected Environmental Receptors in the Williston Lake and Peace River Areas of British Columbia. "Prepared for BC Hydro by Dr. T Watson Triton Environmental Consultants

1988 **Limnology**

Objective: Determine the bio-chemical status of the waters of Williston Reservoir as a baseline for lake productivity estimates.

- Oxygen levels high and summer thermoclines were weakly developed.
- Nutrient levels and productivity indices confirmed the oligotrophic nature and relative low productivity.
- Copper and chromium levels exceeded Canadian water quality guidelines for the protection of aquatic life.

Completed: 1988

Report(s): No final report was completed. but the information is summarised in: G3 Consulting Ltd. 1994. Environmental Effects Monitoring (EEM), Williston Reservoir, Study Design Report. Prepared for Finlay Forest Industries Inc. and Fletcher Challenge Canada Ltd., Mackenzie Pulp. 93 pp. (+Appendices) (Location: Pollution Prevention, PG)

1988 **Dioxin Monitoring Program**

Objective: Provide tissue samples of fish species captured near the outfall from the Mackenzie Pulp mills to determine if there was a potential health problem.

- Dioxin levels were within acceptable limits.

Completed:1988

(8) Report(s): information is contained in Dioxins and furans in sediment and fish in the vicinity of ten inland pulp mills in British Columbia. Water quality branch, inland waters, Pacific and Yukon region, Environment Canada, North Vancouver 1989

1988 **Williston Reservoir Tributary Video Surveys**

Objective: Provide a permanent record of habitat available for fish production in tributary streams of Williston Reservoir and identify key spawning, rearing, potential problem areas and identify enhancement opportunities.

- 1561 km or 59 tributary streams were surveyed.
- Maps indicating fish distribution, blockages, barriers and available reach and feature information completed.

Completed :1988

Report(s): No. 56 Spawning and rearing habitat assessment of Williston Reservoir tributaries. C.M. Retzer. January 1989. 35pp.
videos and maps are on file

1989

1989 **Stream Inventory**

Objective: Evaluate the status of various sports stocks and assess enhancement opportunities in selected tributaries.

- 17 streams were surveyed and 75 potential enhancement projects were identified.
- Most streams were grossly under utilised.
- Nearly all juvenile rearing was associated with small streams entering the reservoir or tributaries of larger rivers.
- Significant numbers of kokanee holding in side channels of the Finlay River in October.

Completed: work completed in 1989 but stream surveys are ongoing

Report(s): No. 70 Fisheries resources and enhancement potentials of selected tributaries of the Williston Reservoir. Volume II. A.R. Langston and B.G. Blackman. April 1993. 185pp plus appendices.
unpublished report Fisheries resources and enhancement potentials of selected tributaries of the Williston Reservoir. Volume I. B.G. Blackman. 1993. 52pp plus appendices

1989 Small Lake Inventory

Objective: Conduct lake surveys on selected small lakes within the Williston Reservoir Watershed to identify enhancement opportunities.

- Surveys conducted on 14 small lakes and 41 potential enhancement projects were identified.
- Rainbow trout were released into Bruce, Tobin, and Canty Lakes.
- Lake survey reports completed for all lakes surveyed in 1989.

Completed: 1989 but further studies are ongoing

Report(s): see report list

1989-97 Stocking

Objective: This stocking program was carried out to provide recreational fisheries opportunities and to establish populations in barren systems.

Project Events:

1989	Rainbow trout released into Tobin Bruce and Canty Lakes.
1990	Kokanee released into Manson and Nation Rivers, and Dunlevy and Carbon Creeks. Marked Blackwater rainbow trout released into Carbon and Dunlevy Creeks to establish a river and embayment fishery respectively. Gerard Rainbow trout released into Tchentlo Lake.
1991	Kokanee released into Manson, Nation, Dunlevy and Carbon Creeks. Blackwater Rainbow trout released into Carbon and Dunlevy Creeks, Gerrard Rainbow trout released into Tchentlo Lake. Small lake stocking included, Butternut, Heather, Albert and Wright Lakes.
1992	Rainbow trout releases included, 113,000 into fourteen small lakes, 16,000 Blackwater rainbow trout into Carbon Creek and 26,000 Gerrard rainbow trout released into the Nation Lakes. Nation R., Carbon Ck., Dunlevy Ck and Manson R were stocked with 453,000 kokanee. Four small lakes were stocked with 50,000 brook trout.
1993	121,500 rainbow trout released into 18 lakes, 45,000 brook trout released into three lakes and 400,000 kokanee released into four rivers.
1994	Twelve small lakes stocked with 69,000 rainbow trout, 55,000 brook trout were released into three lakes. 417,000 kokanee fry released into four rivers entering the reservoir to establish naturally reproducing runs.
1995	62,500 rainbow trout released into nine lakes, 57,500 brook trout released into five lakes and 400,000 kokanee released into four rivers.
1996	84,850 rainbow trout released into sixteen lakes, 55,000 brook trout released into five lakes and 404,000 kokanee released into three rivers.
1997	400,000 kokanee released. Dunlevy Ck. was not stocked, instead 50,000 released into Davis R. were unable to obtain a permit to released fish into Mugaha CK.

Assessment: multiple spawner surveys and stock assessments

Completed: ongoing

Report(s): none

1989 Creel Survey

Objective: Determine angler effort, distribution, success and preferences to be compared with past surveys and serve as a baseline to evaluate enhancement projects.

- 3081 angler days on the reservoir, down 40% from a 1977 survey.
- Estimated catch per unit effort of 0.29 and 0.48 fish per angler hour from Dunlevy and Finlay Bay respectively..

Completed: 1989

Report(s): No. 256 Williston Reservoir 1989 Creel Report. Blackman B.G. and K. Newsholme May 1993 26pp plus appendices.

1989 Williston Lake Survey

Objective: Evaluate the status of various sports stocks in selected embayments via a trap netting and tagging program.

- Program terminated because insufficient numbers of sports fish were captured to justify the program.
- Very large numbers of non-sport species were captured in Dunlevy Ck. embayment.

Completed :1989

Report(s): no report

1989-1996 Kokanee Spawner Surveys

Objective : Determine the distribution, relative numbers, and timing of kokanee spawning in Williston Watershed Streams in order to provide baseline data and identify enhancement opportunities.

Project Events:

1989 Preliminary ground surveys found kokanee holding in side channels of the lower Finlay River in the month of October.

1990	Aerial surveys, of 18 systems found kokanee, only in the lower Finlay River contract tendered to evaluate habitat use and gather life history information on the kokanee utilising the lower Finlay River.
1991	Contract was tendered to radio tag kokanee in the lower Finlay River. • Project met with limited success because of the difficulties with radio tagging small fish, high bull trout predation, and possible changes in behaviour because of the tagging. • The Finlay kokanee do not spawn until late October or early November after the river has frozen. • Fish hold in groundwater fed sidechannels, which maintain water temperatures of approximately 4C even when the main river starts to freeze.
1993	Small contract to the Hudson's Hope Rod and Gun Club ,and helicopter surveys to count kokanee returning to the streams where they were released. • No kokanee were observed, however there were some unverified reports of kokanee sightings in the Nation and Manson Rivers.
1994	Returns of spawning kokanee much lower than expected, 400 observed in Dunlevy Ck., 2000 in Philip Ck. a tributary of the Nation River, and none were observed in Carbon or Manson Rivers. There were reports of kokanee in Schooler Ck.
1995	Small numbers of kokanee in Dunlevy Ck.(300), Manson R.(1,700) and Nation R.(5,000) but none in were observed in Carbon, Finlay or Akie Rivers.
1996	No surveys were conducted.
Completed:	kokanee spawner surveys are ongoing
Report(s):	No. 59 Finlay River kokanee (*Oncorhynchus nerka*) spawning survey 1990. R.J. Fielden. January 1991. 40pp plus appendices. No. 62 Williston Watershed aerial kokanee (*Oncorhynchus nerka*) spawning survey 1990. A.R. McLean and B.G. Blackman. December 1991. 10pp plus appendices No. 63 Finlay River kokanee(*Oncorhynchus nerka*) spawning survey, 1991. R.J. Fielden. March 1992. 27pp plus appendices. No. 176 Williston Reservoir Stocked Kokanee Spawning Assessment, 1994. A.R. Langston and R.J. Zemlak. March 1998. 13pp plus appendices.

1990

1990 Small Lake Surveys

Objective: Identify enhancement opportunities in small lakes.

- Twenty small lakes were surveyed, enhancements identified and reports were completed.

Completed: 1990 but program is ongoing

Report(s): see report list

1990 Stream Inventory

Objective: Gather habitat and biological data and identify enhancement projects.

- Stream inventories were conducted on nine streams tributary to Williston Reservoir.

Completed: 1990, but projects are ongoing

Report(s): No. 70 Fisheries resources and enhancement potentials of selected tributaries of the Williston Reservoir. Volume II. A.R. Langston and B.G. Blackman. April 1993. 185pp plus appendices.

1990-97 Mesilinka Stream Fertilisation

Objective: Examine the effectiveness of low level inorganic fertilisation as a technique to increase size at age and standing biomass in a cold northern river.

Project Events:

1990	Preliminary water, and scale samples collected to determine the feasibility of a stream fertilisation program in the Mesilinka River.
1991	Baseline data gathered to allow the evaluation of the project and to determine the amount of fertiliser required to stimulate production. Water chemistry, temperature and flows, insect populations, and fish species, abundance and growth rates data gathered.
1992	Same as 1991.
1993	Baseline data gathered, two tributaries were fertilised and fish population estimates were made.
1994	Nutrients added to the mainstem for the first time and chlorophyll A accrual was two to eight times higher in the test sites than in the control areas. Periphyton development was clearly visible for several kilometres downstream from the release stations.
1995	Mainstem and tributary sections fertilised, different application techniques evaluated, algal response was good and the numbers of mountain whitefish and rainbow trout appeared to have increased in the treatment sections of the river.
1996	Mainstem fertilised and the initial results encouraging. Increased periphyton accrual detectable for 15 km downstream from the drip stations. Preliminary results suggested rainbow trout and mountain whitefish numbers increased two and five-fold respectively. Rainbow trout in the treatment sections exhibited weight gains. Summer snorkel surveys were not conducted due to cold, wet weather, high runoff and poor underwater visibility. Fertiliser for the 1997 season was purchased from the1996 budget.

1997 Final year of the initial study and preliminary results were good. project scheduled to continue for five more years in a maintenance phase with minimal evaluations.

Completed: project is ongoing

Report(s): No. 66 Stream fertilization feasibility study 1991 data report. A.R. Langston. November 1992. 56pp plus appendices
No. 82 Development of a premier northern river fishery: Mesilinka River pre-fertilization progress 1992-93. C.W. Koning, K.I. Ashley, P.A. Slaney, R.W. Land, and P.W. Davidson. November 1995. 37pp plus appendices.
No. 83 Water temperatures of the Nation and Mesilinka River systems 1995. A.R. Langston. November 1995. 22pp.
No. 84 Water temperatures of the Nation and Mesilinka River systems 1996. A.R. Langston. October 1996. 14pp.
No. 85 Development of a premier northern river fishery: Mesilinka River, the first year of fertilization (1994). A.J. Paul, C.W. Koning, K.I. Ashley, P.A. Slaney, P.W. Davidson, and R.W. Land. December 1996. 48pp plus appendices.
No. 187 Development of a premier northern river fishery: Mesilinka River, the second year of fertilization (1995). A.J. Paul, G. Wilson, C.W. Koning, K.I. Ashley, P.A. Slaney, P.W. Davidson, and R.W. Land. June 1998. 57pp plus appendices
No. 196 Development of a premier northern river fishery: Mesilinka River, the third year of fertilization (1996). G. Wilson, G.A. Larkin, K.I. Ashley, P.A. Slaney, R.W. Land, S. Biancolin, and P. Davidson. March 1999. 24pp plus appendices.
No. 197 Development of a premier northern river fishery: Mesilinka River, the fourth year of fertilization (1997). G.A. Larkin, G. Wilson, K.I. Ashley, P.A. Slaney, R.W. Land, and S. Biancolin. March 1999. 27pp plus appendices.

1990-91 Lions Lake Bridge and Spawning Habitat Improvement

Objective: Provide a protected spawning area for Lions Lake rainbow trout.

Project Events:
1990 Funds provided to the Mackenzie High School Forestry Education class to construct a bridge across the outlet stream from Lions Lake.
1991 Approaches to the bridge stabilised and spawning habitat improvements made to the stream through the use of volunteer labour and the Mackenzie High School.

Completed: 1991

Report(s): None

1990 **Inga Lake Weir**

Objective: Restore an old weir in order to maintain water levels in the lake to provide an improved fishery.

- The Program contributed $100,000 to this joint project, with Ducks Unlimited and Mobile Oil which completed the restoration of the weir.

Completed: 1990

Report(s): No report

1990-91 **Summit Lake Net Pen Rearing**

Objective: Determine if the release of larger pen reared rainbow trout or the Gerrard strain of rainbow trout could survive and produce a fishery in a warm squawfish infested lake.

- Funds provided to the Summit Lake Community Association in 1990 and 1991.
- Purchase net pens and fish food to rear rainbow trout for release into Summit Lake.
- Gerrard rainbow trout were also released into the lake.
- All fish released were marked by a fin clip.

Assessment: see evaluation

Completed: 1991

Report(s): none

1992 **Summit Lake Stocking Evaluations**

Objective: Evaluate the effectiveness of the stocking and net pen rearing program in Summit Lake through a creel survey and gill netting program.

- Summit Lake dominated by other types of recreational use.
- Very little angler effort and no marked rainbow trout captured.
- Gill netting program failed to capture any marked fish, very few rainbow trout were captured.
- The pen rearing (in co-operation with the Summit Lake Community Association) and stocking program was terminated.

Completed: 1992

Report(s): no report

1990 **Development of the Fisheries Management Plan**

Objective: To provide direction and guidelines to the program.

- Final report completed August 1990 and published in Program report series.

Completed: 1990

Report(s): No. 58 Williston Lake fisheries compensation program management plan. B.G. Blackman, D. Jesson, D. Ableson, and T. Down. August 1990. 38pp

1990-93 **Kokanee Model**

Objective: Develop a computer simulation model for kokanee in the Williston Reservoir to aid in management decisions and information gathering.

- Three year contract issued to develop a kokanee computer model at a cost of $51,000.
- Significant input of time by E. Parkinson Fisheries Research Section MOELP.
- Contract administered by T. Down, Fisheries section head Ft. St. John.
- Model will help aid in management decisions and information gathering in order to facilitate the management of the kokanee population in the reservoir.

Completed: 1993

Report(s): Large Lakes Kokanee Model Version 2.0 users guide Korman, J, T.M. Webb and E.A. Parkinson Province of B.C. Fisheries Project Report RD35.

1990-94 **Carbon and Dunlevy Creek Blackwater Rainbow Trout Stocking Program**

Objective: Evaluate the potential to develop a stream fishery in Carbon Creek and an embayment fishery in Dunlevy Creek through the release of rainbow trout into those systems.

Stocking:

1990 Marked Blackwater rainbow trout released into Dunlevy (5k) and Carbon Creeks (10k).

1991 Marked rainbow trout released into Dunlevy (3k) and Carbon Creeks (8k).

1992 Marked Blackwater rainbow trout released into Carbon Creek(16k).

Evaluations:

1990 Snorkel surveys found only fish released in the upper section of the Carbon Creek remained near the release sites.

1991 Very few rainbow trout remained in Carbon Creek one year after release. Those fish had very good growth rates and high condition factors. A high percentage of the fish released into Dunlevy Creek remained in the stream one year after release.

1992 Again the majority of the fish released into Carbon Creek left the system, whereas the fish released into Dunlevy remained.

- Appeared the size and numbers of fish released into Dunlevy impacted the growth rates of the native stocks, so stocking was curtailed.
- Too many large fish were released.
- Also not expected that the stocked rainbow trout would remain in the stream.
- Spring snorkel surveys in Carbon Creek were impossible because of high water conditions but angling in the lower river did capture low numbers of marked fish.
- Thorough evaluations conducted on Dunlevy Ck. during the spring of 1992 found no stocked (marked) fish spawning in Dunlevy Creek, but there were moderate numbers of small (15-20 cm) marked fish rearing in the river.

1993 No snorkel surveys conducted in Carbon Creek because of the high water levels.

- Angling survey did capture one marked rainbow trout (out of 5), a female that appeared to have spawned. spawning period was earlier and most trout captured had spawned, therefore some spawners may have been missed.
- Three marked (stocked) trout found spawning in Dunlevy (out of a total of 54 spawners).
- But two of these fish had been released into Carbon Creek.

1994 Angling captured one spawned out marked fish in Carbon Creek.

- Difficult to draw any conclusion from this project.
- Fish used for stocking ranged in size from 1-65 g and were severely stressed during transport.
- Most of the released fish had severe fin loss.
- These factors would greatly reduce survival rates.
- Evaluations of returning spawners was incomplete, and a high percentage of surviving fish may have strayed into other streams.
- Numbers of hatchery fish released into Dunlevy Creek were too high and did reduce the growth rates and probably survival rates of wild rainbow trout in that stream.
- Carbon Creek was not a good choice for the study because the low water temperatures (max 11° C) make this stream less than ideal for rainbow trout.

Completed: 1994

Report(s): Stocking evaluations of Carbon and Dunlevy Creeks

1991

1991 **Small Lake Surveys**

Objective: Conduct standard lake surveys on selected small lakes within the Williston Reservoir Watershed and to identify enhancement opportunities.

- Surveys conducted on 12 small lakes. Dina 1,2,& 6, Little Calais, Morfee, Carbon Clearwater, Little Carbon., Simpson, Lemoray 2&3 and Michele Lakes. Reports included in program series.

Completed: 1991 but projects are ongoing

Report(s): see report list

1991 **Stream Inventories**

Objective: To gather habitat and biological data and identify enhancement projects.

- Stream Inventories conducted on two systems, the Misinchinka River and its tributaries and Nabesche River.

Completed: 1991

Report(s): No. 70 Fisheries resources and enhancement potentials of selected tributaries of the Williston Reservoir. Volume II. A.R. Langston and B.G. Blackman. April 1993. 185pp plus appendices

1991 **Scott and Weston Ck Adult Fish Traps**

Objective: To gather life history information on fish species (primarily bull trout) utilising Scott and Weston Creeks.

- 60 bull trout captured leaving Scott Creek in early September.
- These fish presumably entered the river before early July and had finished spawning by early September.
- No bull trout were captured from Weston Creek but high water levels in early September made the trap inoperable.

Completed: 1991

Report(s): No. 64 Bull Trout (*Salvelinus confluentus*) survey in Scott Creek and Weston Creeks conducted by the Lheit-Lit'en Nation August to September, 1991. T. Slaney. March 1992. 24pp plus appendices.

1991-97 Carbon Creek Side Channel

Objective: A lack of good spawning habitat (poor substrate and extreme floods) has been identified as a key factor limiting production in this system. In order to improve this situation, several potential side channel areas were surveyed with the objective of developing a groundwater fed sidechannel.

Project Events:

1991 Survey conducted to determine the feasibility of creating a groundwater fed side channel in Carbon Creek to provide spawning and rearing habitat for native and introduced fish species.

1992 A groundwater fed side channel was located and detailed surveys were conducted.

- Channel design was formulated, reviewed by engineers with expertise in this field and modifications were made on their recommendations.
- Construction schedule and cost estimates were developed and verified.
- Materials for construction were located and all the appropriate permits were obtained.
- Due to of the uncertainty of the groundwater supply and limited outside funding, no construction was completed this year.

1993 No construction or contracts were issued for this project.

- Data was provided to B.C. Hydro's Hydroelectric Engineering Division, who provided cost estimates for evaluating potential groundwater flows.
- Hydroelectric Engineering Division suggested excavating the channel would provide more accurate information at reduced costs if one were to accept the fact that construction would have to be stopped if flows were insufficient.

1994 Surveys conducted in September (driest period) to evaluate groundwater levels found a more than adequate water supply was available to supply the channel.

- A detailed topographic survey of the site was completed and a flood return study was conducted.
- Flood return study indicated that Carbon Creek would experience overbank flooding once every two years.
- But a dike, 0.3 m in height would protect the channel to the 100 yr. flood level.
- Detailed channel design including cost estimates and construction schedule completed.

1995 Construction and clean up costs for this project were $43,000.

- Both channels A and B were excavated, a protective dike was built along the length of the channel and an access road was completed.
- Flows in the channel were approximately 1.0 m3 / sec (25cfs) initially but by the end of the construction phase, flows had dropped to approximately half that level.
- However, there was no rain during the month of September and flows in the mainstem adjacent the channel were nearly sub gravel.

- It appear that the mainstem of Carbon Creek would dry before the channel.
- An additional $50,000 for construction was approved for this project through Watershed Restoration.
- Funds were used to haul gravel to the site after the ground had frozen.
- Carry over ($15,000) from these funds used to distribute the gravel and complete a site clean up.

1996 FRBC funds used to haul spawning gravel (provided by B.C. Hydro) to the site in March.

- Gravel placed into the side channel during the summer using carried over FRBC funds.
- Flows in the channel were excellent and revegetation of the disturbed areas was good.
- Attempts to capture pre-spawning kokanee in the embayment for transport to the channel were unsuccessful, many of the fish in the area appeared to have moved up into the streams.
- Attempts to capture kokanee from the intake towers at the dam were also unsuccessful.

1997 Beavers moved into the lower channel, blocking access to the channel. Very few adult fish were captured to move into the channel.

Completed: construction completed 1996

Report(s): No. 81 Carbon Creek spawning/rearing channel preliminary design. M.R. Morgan. April 1995. 24pp plus appendices.
Carbon Creek Management Plan was completed to a "draft "stage

1991 Windy Point Access Improvement

Funds were provided to the Ministry of Forests to provide public access and a recreation site at Windy Point Lake to insure public access in preparation for construction of an upwelling station for spawnbound rainbow trout.

Completed: 1991

Report(s): no report

1991 Kwawli River Debris Removal

A contract was awarded to remove a large debris jam on the Kwawli R (Nation Lakes) which could be a barrier to fish passage.

Assessment: due to technical difficulties the jam was not completely removed

Completed: project terminated 1991

Report(s): none

1991 Camp Sites Nation Lakes

Funds were provided to Min. of Forests to construct 12 boat accessible camp sites in the Nation Lakes Chain.

Assessment: these sites receive exceptional use

Completed: site were completed in 1991

Report(s): none

1991 Moberly and Gwillim Lake Management Plans

Objective: To develop fisheries management plans for these high use lakes.

Completed 1991

Report(s) are on file in Ft. St. John

1992

1992 Dinosaur Lake Enhancements Review

Objective: Evaluate existing data and determine what enhancement options are possible in a run of the river reservoir, specifically Dinosaur Lake.

The report suggests several enhancement options to reduce entrainment, increase rearing habitat in the reservoir and to improve spawning habitat.

These options include:

a) Pen rearing to reduce entrainment.
b) Artificial structures (either floating or on the bottom) to provide rearing habitat.
c) Johnson Creek watershed restoration, transplanting bull trout above the falls on Gething Creek or creation of an artificial spawning channel to improve spawning potential.

Completed: 1993

Report(s): No. 72 Fisheries enhancement options for Dinosaur Lake, A Review. R. Pattenden and G. Ash. April 1993. 38pp plus appendices.

1992 Arctic Grayling Enhancements Review

Objective: This contract was designed to determine:

a) What enhancement and management options are available for Arctic grayling?
b) What activities have been used in other areas, which activities have been successful, which have failed and why?
c) What are the long term ramifications of enhancements and which are appropriate in the Williston watershed?

The report did not recommend any specific enhancement projects but did suggest that the successful management and enhancement of grayling in the Williston watershed will demand an aggressive approach on four fronts:

a) Filling gaps in the understanding of basic grayling biology both locally and regionally.
b) Limiting negative impacts of development and resource use on grayling habitat.
c) Applying the most promising management and enhancement practices on grayling populations, habitat, and fisheries in an adaptive and experimental manner.
d) Providing the public with meaningful and exiting opportunities to understand grayling and appreciate their habitat.

Completed: 1993

Report(s): No. 78 A review of management and enhancement options for the Arctic grayling (*Thymallus arcticus*) with special reference to the Williston Reservoir Watershed in British Columbia. T.G. Northcote. 1993. 69pp.

1992 Embayment Feasibility Study

Objective: Conduct a literature review and evaluate the feasibility of potential embayment enhancements.

- Contract suggested foreshore planting (establishing vegetation in the drawdown zone) probably has the best enhancement potential and would be very beneficial to fish stocks utilising embayment areas.
- No studies have been conducted at northerly latitudes and therefore the report recommends small scale pilot projects to test the survivability and methodologies for introductions of various plant species in the drawdown zone.
- Other options that discussed include artificial reefs, substrate and structures, fertilisation, stocking, tributary improvements, species introductions and cove culture.

Completed: 1993

Report(s): No. 69 Embayment enhancement feasibility study Williston Reservoir. R.J. Fielden, T. Slaney, and A.W. Wood. March 1993. 28pp plus appendices

1992 - 93 Nation River Arctic Grayling Transplant

Objective: Create a genetic reserve in a barren headwater lake for Arctic grayling stocks from the Nation River and gather life history information on fish stocks from that system. Little Calais lake had no game fish but did support a population of large scale and fine scale longnose suckers.

Project Events:

1992 One week of angling captured of 84 Arctic grayling.

- 26 of these fish died in holding and transport leaving 58 fish transplanted into Little Calais Lake.
- High moralities were attributed to severe and rapid fungal attacks brought on by excessive handling, high water temperatures and limited flow through the holding pens.
- Life history data on Arctic grayling and rainbow trout was gathered as part of a transplant project.

1993 25 grayling transplanted into little Calais Lake.

- These numbers, in addition to the 58 grayling transplanted in 1992, should provide an acceptable number of individuals from which to build a genetic reserve population.
- This year there were only three mortalities, a great improvement over the 1992 program.
- Very few large fish were captured and numbers appeared to be lower that in 1992.

1996 A brief stock assessment conducted on Little Calais Lake failed to find any Arctic grayling.

- Rainbow trout were captured in the lake.
- Presumed these fish were a result of fish released into Albert Lake which had moved upstream through Calais Lake.

Assessment: An Arctic grayling population did not establish in the lake.

Completed: 1993

Report(s): No. 189 Calais Lake fish population status, 1998. A.R. Langston. February 1999. 11pp plus appendices.

1992-97 Dina Creek Habitat Improvement

Objective: The objective of this project was to provide a high quality spawning area for rainbow trout released into Dina Lake #1.

Project Events:

1992 Co-operative program with the Mackenzie Fish and Game Association was initiated with 200 hours of volunteer labour in 1992.

- Up to six hundred spawners were counted in the stream and there was very high public viewing.
- Additional funds were authorised by the Technical Committee and rip rap was stock piled on site in preparation for the 1993/4 program.
- The Mackenzie Fish and Game Association provided additional funding and labour for the 1993 project.
- The club also assisted in stocking 8,000 rainbow trout into Dina Lake's # 3 and #7, barren lakes in the Dina system.

1993 Mackenzie Fish and Game Club provided $5,000 in funds and 500 hours of labour to assist in stream complexing.

- Media coverage of the project was excellent (National coverage on CBC).
- Over 150 rainbow trout and approximately 40 brook trout spawned in this stream, providing very popular viewing opportunities.

1994 Maintenance and improvements to this site completed as planned with excellent public involvement and media coverage.

- Large numbers of rainbow trout (up to 500) have spawned in the stream each spring and a smaller number of brook trout use the same area each fall.
- Trail development and facilities have made this a highly popular area for the residence of Mackenzie and tourists.
- This public involvement project has been supported fully by local industry and has received excellent media coverage.

1995 600-1000 rainbow trout plus low numbers of brook trout spawned in the channel and a Program sign was erected.

1996 Channel maintenance undertaken and 800-1000 rainbow trout spawned in the stream.

1997 Channel maintenance (gravel cleaning, silt removal etc.) undertaken.

Assessment: highly successful public involvement project

Completed: maintenance is ongoing

Report(s): none

1992-97 Windy Point Upwelling Station

Objective: Construct a pilot upwelling station to relieve a chronic spawning bound problem in a small stocked lake to improve the fishery.

Project Events:

1992 Installation of the upwelling spawning station completed.

- Project required more manpower than anticipated because the recommended water pump and one with double the capacity were insufficient to provide adequate flows to operate the station properly. Up to 40 rainbow trout, at a time were observed using the station, despite the low flows.
- A proper pump was purchased, the hydro line and pump house were completed, but the hydro connection and clean up of the line was deferred to 1994.

1994 Windy Point upwelling station was fully operational this year.

- Throughout the spawning period 20 to 40 adult rainbow could be observed using the site at any given time.
- The operating period for the station was extended because the trout utilised the station for longer than expected.

1995 Station in operation, no major repairs.

1997 Evaluations suggest that the upwelling station has not been completely successful at alleviating the spawnbound problem.

Assessment: not successful at alleviating the spawnbound problem

Completed: was removed in 2001.

Report(s): no formal report

1992 Gantahaz Lake Enhancement and Assessment

Objective: Gantahaz Lake, near Mackenzie, has been stocked for many years with brook trout and supports a high use recreational fishery. A stock assessment, conducted on this lake, indicated that there could be a spawnbound problem, which could result in poor angler catches.

- In September 1992, gravel was placed along the shoreline of the lake to provide additional areas for spawning.
- A winter creel survey was conducted to determine the effectiveness of the stocking program.

Completed: 1992

Report(s): No. 71 Creel survey of the winter 1992/93 Gantahaz Lake ice fishery. A.R. Langston. April 1993. 15pp plus appendices.

1992 Manson River Inventory

This project was cancelled because of the "Donna Creek Slide" which deposited tons of silt and debris into the system.

1992 Tomias and Carina Lakes Lake Trout Investigations

Objective: Gather lake trout life history information, and collect mercury and disease samples for analysis.

- To collect proper disease samples post spawning fish are required.
- Cold temperatures (-30^{0}C) in mid October resulted in the lake freezing immediately after the crew arrived and no samples were collected.

Completed: no

Report(s): none

1992 Small Lake Inventory

Objective: Identify and evaluated enhancement opportunities on small lakes.

- Small lake inventories conducted on seven small lakes and enhancement opportunities identified for each lake.
- The survey on one small lake was not completed because of an equipment failure.

Completed: 1992

Report(s): see report list

1992 Gething Creek Inventory

Objective: Determine if the habitat in Gething Creek was suitable to support bull trout as baseline information prior to transplanting bull trout into the system.

- Inventory, conducted under the direction of T. Down, partially completed at a preliminary level.
- Gething Creek determined suitable to support bull trout but no gamefish were found upstream from the barrier falls.
- Plans developed to transplant bull trout into the barren upper watershed.

Completed: 1992

Report(s): no report

1993-97 Gething Creek Bull Trout Transplant

Objective: Transplant bull trout upstream past a barrier to provide improved spawning and rearing habitat and improved recruitment into Dinosaur Reservoir.

1993 Manpower requirements were much higher than expected because of high stream flows.

- Twelve bull trout, nine females and three males were captured at the base of Gething Creek falls.
- The fish were moved to, and spawned in the upper reaches of Gething Creek.
- The fish were recaptured, after they had spawned, and transported back to Dinosaur Reservoir to prevent potential injuries, which would have resulted if they descended the falls on Gething Creek.

1994

Objective: Determine if Gaylard Ck. was suitable for bull trout rearing and evaluate potential barrier problems.

- Inventory of Gaylard Creek determined the stream was suitable to support a population of bull trout.
- Installation of fish ladders determined to be impractical at the barrier falls.
- The falls are too high and inaccessible.
- Seven male and nine female bull trout were captured at the base of the falls on Gething Creek and transplanted into Gaylard Creek.
- After the fish had spawned they were recaptured and returned to Dinosaur Reservoir.

Project Events:

1995 Project cancelled because of manpower and budget limitations.

1996 Transplant unsuccessful this year despite two separate attempts to capture the bull trout. Insufficient numbers of fish were available to justify the project, which could have been because of the spill at the W.A.C. Bennett Dam.

1997 Nine female and five male bull trout were captured below Gething Creek falls, released to spawn in the upper river, recaptured after they had spawned and returned to Dinosaur Reservoir.

Completed: ongoing

Report(s): No. 140 A reconnaissance survey of Gaylard Creek and bull trout habitat suitability, 1994. A.R. Langston and R.J. Zemlak. 1998. 16pp. plus appendices.

1992 **Moberly River Inventory**

Objective: Collect biophysical and life history data and identify enhancement opportunities.

- Bull trout and rainbow trout found throughout the system but never at the same sites.
- Good Arctic grayling habitat was available but no grayling were found.
- Many of the sites provided good fish habitat but no fish were found.
- Beaver activity on a number of tributaries was noted as potentially blocking fish movement.

Completed: 1992

Report(s): No. 67 Stream surveys of the west (Upper) Moberly River Watershed (Summer, 1992). H. Hohndorf, G. Hopcraft, and T. Down. February 1993. 17pp plus appendices.

1992 **Pine River Inventory**

Objective: Identify enhancement opportunities and collect biophysical and life history data.

- Bull trout and rainbow trout were found together at a number of sites.
- No Arctic grayling were found.
- A number of sites were found that had good recreational fisheries potential but no gamefish species were present.

Completed: 1992

Report(s): Stream Surveys of tributaries to the upper Pine River by Hopcraft, G., H. Hohndorf and T. Down Peace sub region Fisheries Technical Report series Report No. PCE 47.

1992 **Cameron River Assessment**

Objective: A contract was tendered to evaluate the enhancement potential, determine the extent of beaver activity in the system, and estimate the costs and potential benefits of beaver dam removal.

- Contract completed, and a report produced.
- Maps produced which show the location of the beaver dams.
- An analysis has been provided estimating the costs and relative benefits of beaver dam removal.

Completed: 1992

Report(s): completed on file in Ft. St. John

1993

1993 **Small Lake Inventory**

- Four small lake surveys completed.
- One partial survey was also conducted to complete work started in 1992.

Completed: 1993 but projects are ongoing

Report(s): see report list

1993 **Small Lake Enhancement Assessments**

Objective: The feasibility of potential enhancement projects on several small lakes were examined.

- No priority enhancements found.
- Less time spent on this project than was budgeted because of manpower limitations.

Completed: 1993

Report(s): nor formal report

1993 **Grizzly Lake Rainbow Trout Transplant**

- Not undertaken because of manpower limitations.

1993 **Pine River Debris Catchers**

Objective: Provide instream habitat for adult gamefish species.

- Administered by T. Down, Fisheries Section Head in Ft. St. John.
- Six sections of the stream enhanced using eleven debris catchers, two bank boulder groins and one bank anchored LOD unit.
- Costs were $40,000 HCF funds, plus $14,788 from PW(FWCP.

Assessment: Pine River fish habitat project: post enhancement assessment report, prepared for B.C. Environment by Triton Environmental Consultants Ltd.

Completed: 1993

Report(s): Pine River fish habitat project final report prepared for B.C. Environment by Triton Environmental Consultants Ltd.

1993-94 Stewart Lake Flow Control

Objective: Maintain a high quality fishery, by stabilising lake volume, to provide protection against a winter kill.

- Stewart Lake is a small stocked lake near Chetwynd that provides an increasingly popular fishery.
- Water levels in the lake were controlled by a small dam, which over the years has begun to deteriorate.
- Has resulted in, a lowering of the lake water levels.
- Winter oxygen levels are low enough that there is a danger of a winter kill.
- PWFWCP provided $70,000 and HCF provided additional funds to rebuild this dam and increase the water levels, greatly reducing the chances of the loss of this fishery through a winter kill situation.

Assessment: none

Completed: 1994

Report(s): none

1993 Enhancement Signs

Objective: Produce signs to help inform the public of Compensation Program activities and projects.

- Locations and layouts for the signs were developed but no agreement could be reached on the final wording of the signs.
- Funds were spent for small posters and plywood backing.

1993 Firth Creek Enhancement

Objective: Provide habitat improvements on a small stream.

- Project not budgeted for and was completed under the Environmental Youth Crew Program initiated by BC Hydro in Prince George.
- Costs to BCH were $4,000 plus four students wages.

- Enhancement was a habitat improvement project on a small stream crossing a hydro right of way.

Completed: 1993

Report(s): No. 77 Firth Creek habitat enhancement project 1993. A. R. Langston. December 1993. 9pp plus appendices.

1993 Small Lake Evaluations

- No evaluations conducted because of budgetary and manpower constraints.

1994

1994 Small Lake Evaluations

Objective: Evaluate the effectiveness of our enhancements in establishing fisheries.

- A small rainbow trout population has established in Canty Lake.
- Natural reproduction is limited by beaver activity on the outlet stream.
- A small number of large rainbow trout were found in Bruce Lake.
- But there were no signs of natural reproduction, again because of beaver activity.
- Both of these lakes support small fisheries and will be stocked with low numbers of trout every three or four years.
- If road access to Bruce Lake is improved potential enhancements on the outlet stream have been identified.

Completed: 1994

Report(s): No. 123 Fish habitat enhancement potential and stocking assessment of Bruce Lake. R.J. Zemlak and A.R. Langston. 1994. 12pp plus appendices.

No. 124 Fish habitat enhancement potential and stocking assessment of Canty Lake. R.J. Zemlak and A.R. Langston. 1994. 13pp plus appendices

1994 Dunlevy Fence

- Not conducted , but was resubmitted for the 1995/96 year.

1994 **Nation River Arctic Grayling Traps**

Objective: Gather life history data and determine the status of Arctic grayling in the Nation River.

- Fish fences operated on two tributary streams of the Nation River.
- Failed to capture any Arctic grayling.
- Two distinct populations of rainbow trout were found utilising one of the streams.
- The two study streams may not be the primary spawning locations for the Nation River Arctic grayling stocks. Further attempts to capture pre spawning grayling are not recommended.

Completed: 1994

Report(s): No. 76. Langston, A.R. and R.J. Zemlak. 1997. Summary of the 1994 Fish Trapping Operations on Suschona and Sylvester Creeks. 12pp plus appendices.

1994-97 **Grizzly (Simpson) Lake Rainbow Trout Transplant**

Objective: This project will establish a wild rainbow trout population in Grizzly Lake a barren headwater lake in the Pine River System.

Project Events:

1994 Sources of wild rainbow trout to use a donor stock for the transplant were difficult to find.
- Information from local residents and BC Hydro employees suggested fish might be captured in the intake towers at WAC Bennett Dam.
- 26 wild rainbow trout were captured from the towers and transplanted into Grizzly Lake in August.

1995 No work undertaken.

1996 The first attempt to move rainbow trout from the intake towers at the W.A.C. Bennett dam into Simpson Lake was cancelled, because of heavy snow on the access road to Simpson Lake.
- Second attempt, conducted in July, captured 62 rainbow trout from the intake towers at W.A.C. Bennett Dam and moved the fish to Simpson Lake.
- Project conducted with the assistance of the Chetwynd Rod and Gun Club and the Conservation Officer Service from Chetwynd.

1997 Seventy-five wild rainbow trout were captured and transported to the lake with the assistance of the Chetwynd Rod and Gun Club. An onsite meeting, by a multi-disciplinary team was held to discuss future access management to the lake.

Assessment: No. 216 Simpson Lake rainbow trout transplant assessment, 1999. R.J. Zemlak. May 2000. 10pp plus appendices.

Completed: 1997

Report(s): No. 139 Simpson Lake rainbow trout transplant, 1994. A.R. Langston and R.J. Zemlak. 1998. 9pp.

1994 Dinosaur Reservoir Enhancement

Objective: Provide rearing habitat in Johnson Creek embayment to help address entrainment problems.

- Previously studies on Dinosaur Reservoir suggested, that limited spawning and rearing habitat severely reduces fish production and that lack of rearing habitat in the reservoir significantly contributes to the entrainment problem (fish move out of the reservoir downstream into the Peace River).
- To address this issue a habitat improvement project has been undertaken in Johnson Creek Embayment. Forty floating and submerged brush piles were installed along a 150 metre section of the shoreline at the mouth of Johnson Creek.
- These brush piles were made up of 4-6 coniferous trees (3-6 m in height) cabled together with stainless steel cables and anchored with cement blocks in 1-2 meters of water.

Assessment: after two years the brush piles were buried in silt

Completed: 1994

Report(s): none

1994 Moberly River Assessment

Objective: Evaluate the status of rainbow and bull trout stocks in the system.

- Very low numbers of bull trout found in the upper watershed of the Moberly River.
- Moderate populations bull trout & Arctic grayling present in the lower river.
- No potential enhancements found for the upper and mid reaches of the river.
- Instream structures in the lower river could increase adult holding water.

Completed: 1994

Report(s): no formal report completed

1994 **Misinchinka Tributary Assessment**

Objective: Identify enhancement opportunities in the tributary streams of the Misinchinka River.

- No low risk enhancements were found on tributaries with potential for machine access.
- Flow in the lower reaches of many of these tributaries was sub-gravel by mid summer.
- Streams with reliable flows, had intensive beaver activity, which would make habitat improvements very difficult and result in high maintenance costs.
- Spawning habitat improvements in the tributary streams of this system would be very beneficial but no suitable sites were found.
- Beaver dams blocking fish access to tributaries is a serious problem in this system.

Completed: 1994

Report(s): no formal report

1994 **Manson River Stock Evaluations**

Objective: Determine the status of fish stocks and ascertain the effectiveness of the stream closure for rebuilding the populations.

- One day snorkel survey conducted to determine if fish numbers have improved since the river was closed to fishing.
- A slight increase in fish numbers but more intensive evaluations are required to conclusively determine the effects of the stream closure.

Assessment:

Completed: 1994

Report(s): no formal report

1994-97 **Table/Anzac Arctic Grayling Surveys**

Objective: Gather life history information on Arctic grayling and determine enhancement opportunities.

Project Events:

1994 Brief survey conducted to confirm that Arctic grayling were present in the Table River and to gather information for an intensive inventory program scheduled for 1995. An aerial stream video was also completed.

1995 Watershed Restoration (Forest Renewal B.C.) provided an additional $41,000 for this project.

- Funding allowed more detailed evaluations to be conducted and two technicians from the Saulteau First Nations Band were employed to assist in the project.
- Greatly increased the amount of life history information available on Arctic grayling a "red listed species". Population estimates were made on the mainstem inhabitants and detailed habitat utilisation information was gathered for adults.
- Flood conditions throughout much of the summer made obtaining juvenile information difficult.
- It is possible that a high percentage of the young of the year fry were lost this year because of the high flow conditions.
- A small number (12) of Arctic grayling fry were captured.
- A number of habitat restoration / enhancement projects were identified.

1996 Watershed Restoration (Forest Renewal B.C.) provided an additional $91,000 for this project.

- Funding allowed more detailed evaluations to be conducted and two technicians from the Saulteau First Nations Band were employed to assist in the project.
- Detailed surveys of adult Arctic grayling habitat utilisation and were carried out in conjunction with habitat availability surveys.
- Information was used to help determine habitat preferences.
- Young of the year Arctic grayling distribution and habitat utilisation evaluations completed.
- Information gathered has been incorporated into habitat protection guidelines to increase protection of critical habitats.
- Inspections conducted on a number of potential habitat improvement sites with a BC Environment hydrologist, a Ministry of Forests engineer and a local engineering contractor.
- Preliminary plans developed to improve the sites.
- Large debris jam removed, using a helicopter and grapple, as a result of the site inspections.

1997 Watershed Restoration (Forest Renewal B.C.) provided an additional $144,000 for this project. This funding allowed more detailed evaluations to be conducted and two technicians from the Saulteau First Nations Band were employed to assist in the project.

- Surveys conducted of the distribution of newly hatched fry, and habitat utilisation of young of the year fry. Habitat preference data was collected on Arctic grayling, burbot, and bull trout fry.
- Adult habitat preference data collected.

Completed: ongoing

Report(s): No. 173 Fish species presence and abundance of the Table River, 1995. R.J. Zemlak and A.R. Langston. March 1998. 28pp plus appendices.
No. 178 A reconnaissance survey of the Table River: 1995 status report. A. R. Langston. April 1998. 31pp plus appendices

No. 180 A summary report of the Table River surveys 1996 status report. K. Mathias, A.R. Langston, R.J. Zemlak. May 1998. 62pp plus appendices.

1994 Finlay River Lake Trout Assessment

Objective: Determine if a river spawning stock of lake trout is present in the upper Finlay River.

- No lake trout were observed, but extreme storm and flooding events made conditions very difficult.
- Study cannot confirm nor deny the possibility of a river spawning stock of lake trout in the area.
- Possibility of an extremely rare (two known stocks in Canada) river spawning stock of lake trout warrants further investigations, particularly in light of the potential impact such a stock could have on the reservoir fishery.

Completed: 1994

Report(s): No. 80 Finlay River lake trout spawning investigation. R.J. Zemlak and A.R. Langston. December 1994. 6pp plus appendices.

1995

1995 Dunlevy Fence

Objective: Gather information on fish movements in and out of Dunlevy Creek, obtain life history information and evaluate returns of stocked rainbow trout and kokanee to this stream.

- Dunlevy fence was operated and maintained by the Saulteau First Nations Band. Extremely high flows resulted in very difficult trapping conditions.
- Most of this seasons young of the year fry were lost to extreme floods.
- Upstream and downstream migration counts were incomplete because high flows destroyed the first fish fence.
- Over 400 rainbow trout were captured (much higher numbers than anticipated) and approximately 300 kokanee entered the stream this year.
- Contract went significantly over budget in part because of the staff required to deal with the unusually severe flood conditions.
- Saulteau First Nations Band operated the fence and were extremely co-operative and conscientious about the work.

Completed: 1995

Report(s): No. 172 Fish trapping operation on Dunlevy Creek, 1995. R.J. Zemlak. March 1998. 17pp plus appendices.

1995 Outside Funding (Watershed Restoration)

- FRBC (Watershed Restoration Program) provided $40,750 in funding for the Table River Inventory.
- Joint submission through Canadian Forest Products Ltd. for $50,000 was approved to assist in construction of the Carbon Side Channel.
- Watershed Restoration Program approved $44,700 to conduct stream video surveys, mapping and habitat evaluations on the Hominka, Parsnip, Mesilinka, Omineca, Osilinka and Ospika Rivers.
- Video surveys were not completed because of weather conditions but the funds were carried over to 1996.

Completed: 1996

Report(s): see Table and Anzac River studies
no formal report completed on Carbon Side Channel
Stream Video/GPS Survey Conducted on Six Tributary Rivers to Williston Lake Vol I & II plus By TC White, EDI Environmental Dynamics, stream video tapes on file

1996

1996-97 Arctic Grayling Radio Telemetry

Objective: Determine the spawning areas of Arctic grayling in the Table and Anzac rivers in order that these areas may be documented and protected.

Project Events:

1996 Radio transmitters were surgically implanted into 25 Arctic grayling from the Table River and into 30 from the Anzac River during late August and early September.

- Tissue samples were taken from all fish for genetic analysis.
- Six telemetry flights conducted from September 1996 to March 1997 to determine the distribution of the fish. most of the Table River fish had moved to overwintering areas by September 24th.
- Anzac River fish were still in the Anzac on Sept. 24th but only two remained in the Anzac by November 6th. The majority of the Anzac River fish overwintered in the Parsnip River downstream from its confluence with the Anzac.
- There were no concentrations of tagged fish at a single site and a small number of fish moved short distances during the winter.
- Forest Renewal B.C. contributed $50,000 towards this project in 1996.

1997 Forest Renewal B.C. provided $100,000 for this project.

- Radio tagged grayling were tracked up to twice per week during the spawning season and tracking continued until October.

- Tagged fish overwintered in a wide variety of habitats.
- There were no large concentrations of tagged fish and some fish moved throughout the winter.
- A number of fish (radio tags) moved to the reservoir but never returned.
- Fish stated moving as soon as water temperatures started to rise even before the ice melted.
- Severe floods during the spawning period prevented direct observation of spawning locations.
- Thirty percent of the tagged fish did not spawn in the stream where they had been tagged.
- A high percentage of the fish returned to the area where they had been tagged after spawning.

Completed: 1997

Report(s): Blackman B.G. 1998. Radio telemetry studies of Arctic grayling migrations to overwinter, spawning and summer feeding areas in the Parsnip River watershed. Peace/Williston Fish and Wildlife Compensation Program, Report No. . pp plus appendices

1996-97 Arctic Grayling Genetics

Objective: Examine the genetic structure and degree of similarity of grayling populations within the Williston Reservoir watershed in order to provide baseline information for future projects.

- Tissue samples for genetic analysis were collected from the Mesilinka (60) Anzac (30) Table (30) and Nation (27) rivers.
- Small numbers of samples (<10) were collected from 6 other sites.
- 30 samples collected from 6 sites in the lower Peace River.
- 55 samples received from sites in Alaska and northern B.C.
- Initial analysis has not detected any genetic variation within watershed stocks but there have been detectable differences between Williston and outside stocks.

1997 Samples were collected from five rivers within the watershed, from two rivers in the Peace River drainage downstream from the Reservoirs and two samples were obtained from Alaska.

- Initial analysis showed no distinct differences between B.C. populations. However, more analysis using mitochondrial and microsatellite DNA markers will be necessary before this is conclusive.

Completed: ongoing final report completed in 2001

Report(s): No. 248 Mitochondrial and microsatellite DNA diversity throughout the range of a cold adapted freshwater salmonid: phylogeography, local population structure,

and conservation genetics of Arctic grayling (*Thymallus arcticus*) in North America. Michael D. Stamford. October 2001. 90pp.

1996-97 Mackenzie Schools Kokanee Rearing

Objective: Assist in an educational program to incubate and raise kokanee in a classroom environment at four Mackenzie Schools.

- Project carried out in conjunction with the local school district, Department of Fisheries and Oceans and the Mackenzie Fish and Game Association.
- Tanks and incubators set up, permits acquired and eyed eggs delivered to three Mackenzie elementary schools and one high school.

1997 Aquariums have been set up, eggs delivered and presentations made to three schools in Mackenzie and one in Hudson's Hope for this classroom incubation and rearing project.

Completed: ongoing

Report(s): no formal report

1996-97 Dina Lake #3 Spawning Habitat Improvement

Objective: Create a self sustaining rainbow trout fishery / public involvement project, through a stocking and habitat improvement program.

- Dina Lake # 3 is a small lake in the Dina Lakes chain 30 km north of Mackenzie.
- Rainbow trout have been stocked into this lake with the assistance of the Mackenzie Fish and Game Association and a high use fishery has developed.
- The small inlet stream feeding the lake lacks suitable spawning habitat and as a result there can be no natural reproduction and potentially the fish could become spawnbound.
- To alleviate this situation a spawning habitat improvement project was initiated.
- The Mackenzie Rocky Mountain Riders Snowmobile Club carried 150 bags of spawning gravel to the stream during the winter.
- The Mackenzie Fish and Game Association and biology students from Mackenzie Secondary School assisted Compensation Program staff in the installation of gravel in Dina Creek #3.
- Further gravel transport is planned for this winter.

1997 Biology students from the Mackenzie Secondary School assisted in this spawning habitat improvement project this spring.

- An additional 125 gravel bags were transported to the site during the winter by volunteers from the Mackenzie Snowmobile Club.

Assessment: highly successful public involvement project

Completed: 1997

Report(s): no formal report was completed

1996 Outside Funding

1996 Just under $600,000 in additional funding has been provided through Forest Renewal B.C. this year for projects in the watershed.

- $91,000 was provided for work on the Table River Arctic Grayling Project, to gather life history and habitat utilisation information, and identify enhancement / restoration projects in the watershed.
- Video surveys of key streams in the watershed are underway for two separate contracts with a total value of $214,000. These projects were initiated with input from and the support of Timber West and Finlay Forest Industries. This data will include mapping and some preliminary habitat analysis similar to the work done in 1988 by PWFWCP, but covering different systems.
- The first year of a two year joint Inventory Project with Finlay Forest Industries on the Mesilinka River has been completed at a cost of approximately $70,000.
- FRBC contributed $50,000 towards the Arctic Grayling Radio Tracking Project.
- FRBC has also funded ($151,000) a Small Lake Inventory Project in the Williston drainage. Over 30 new lakes have been surveyed through this project, which has received excellent support from local licensees and B.C. Environment habitat staff.
- An additional $15,000 was also available from carry over of last years budget for gravel placement in Carbon Creek Side Channel (joint submission with Canfor).

Each of these projects was carried out in consultation with, and because of, the support of local licensees and habitat protection personnel. Considerable time and effort was required to develop and manage these projects but significant gains have been made both in our program and in our relationships with the local forest companies.

Completed: 1996

Report(s): see Table and Anzac River reports
stream video's and maps are on file
Fish and Fish habitat inventory of the Mesilinka River and tributaries Prepared for FRBC and PWFWCP by ECL Envirowest Consultants Ltd, 1997 &1998
Blackman B.G. 1998. Radio telemetry studies of Arctic grayling migrations to overwinter, spawning and summer feeding areas in the Parsnip River watershed.
Lake Surveys see report list

1997

1997 **Bullrun and Portage Creek Diversion**

Objective: To conduct a feasibility study to determine if two small streams entering the Peace River just below the Peace Canyon Dam could be diverted to flow into Dinosaur Reservoir. If successful, this diversion would provide much needed spawning and rearing habitat for fish species using the Reservoir.

- Rainbow trout genetic samples were collected from Bullrun and Portage creeks.
- Analysis of the samples showed that a portion of the rainbow trout populations in these systems were of hatchery origin.
- This alleviates genetic concerns about diverting the streams.
- Thermographs and discharge tests were conducted on the streams.

Completed: 1997

Report(s): no formal report

1997 **Stream Access Surveys**

Objective: To determine if fish access to streams flowing into Williston Reservoir is impaired at low reservoir water levels.

- Surveys were completed on 237 streams entering the reservoir.
- 26 stream were identified with access problems.
- 17 of which were as a result of debris accumulations.
- 9 had problems as a result of high natural gradients or culverts at or above the high water line.

Completed: 1997

Report(s): Williston Reservoir Stream Access Surveys

1997 **Outside Funding**

- Forest renewal B.C provided $100,00 towards the radio telemetry project and $144,000 towards the Table and Anzac Arctic grayling project.
- Regional MOELP staff took over the administration of additional projects which were initiated by program staff and where funding was secured from FRBC.

- Projects include $145,000 for small lake surveys (29 completed), stream video surveys ($399,000) and the completion of the Mesilinka watershed inventory ($40,000).
- Copies of the reports and videos are on file.

Completed: 1997

Report(s): Blackman B.G. 1998. Radio telemetry studies of Arctic grayling migrations to overwinter, spawning and summer feeding areas in the Parsnip River watershed.
Blackman, B.G. 1997 Arctic grayling distribution and habitat use in the Table and Anzac Rivers.
Lake Surveys see report list
video surveys are on file
Fish and Fish habitat inventory of the Mesilinka River and Tributaries, prepared for MELP by ECL Envirowest Consultants Ltd.